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(NASA-Case-NPO-11307-1) SILENT EMERGENCY ALARM SYSTEM FOR SCHOOLS AND THE LIKE Patent (Jet Propulsion Lab.) 8 p CSCL 09C

N73-30205

Unclas 00/10 12225

REPLY TO ATTN OF: GP

TO: KSI/Scientific & Technical Information Division
Attention: Miss Winnie M. Morgan

FROM: GP/Office of Assistant General Counsel for Patent Matters

SUBJECT: Announcement of NASA-Owned U.S. Patents in STAR

In accordance with the procedures agreed upon by Code GP and Code KSI, the attached NASA-owned U.S. Patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U.S. Patent No. : 3,750,131

Government or Corporate Employee : Cal/Tech, Pasadena, CA

Supplementary Corporate Source (if applicable) : JPL

NASA Patent Case No. : NPO-11,307-1

NOTE - If this patent covers an invention made by a corporate employee of a NASA Contractor, the following is applicable:

Yes [X] No [ ]

Pursuant to Section 305(a) of the National Aeronautics and Space Act, the name of the Administrator of NASA appears on the first page of the patent; however, the name of the actual inventor (author) appears at the heading of column No. 1 of the Specification, following the words ". . . with respect to an invention of . . ."

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Enclosure
Copy of Patent cited above

United States Patent [19]

Fletcher et al.

[11] **3,750,131**

[45] **July 31, 1973**

[54] **SILENT EMERGENCY ALARM SYSTEM FOR SCHOOLS AND THE LIKE**

[76] Inventors: **James C. Fletcher**, Administrator of the National Aeronautics and Space Administration with respect to an invention of; **William S. Read**, Glendale; **Vasel W. Roberts**, La Cresecenta, both of Calif.

[22] Filed: **Aug. 6, 1971**

[21] Appl. No.: **169,671**

[52] **U.S. Cl.** **340/277**, 340/279

[51] **Int. Cl.** **G08b 7/06**

[58] **Field of Search** 340/312, 148, 15, 340/277, 412, 279, 311, 287, 332; 35/1; 109/21, 38

[56] **References Cited**

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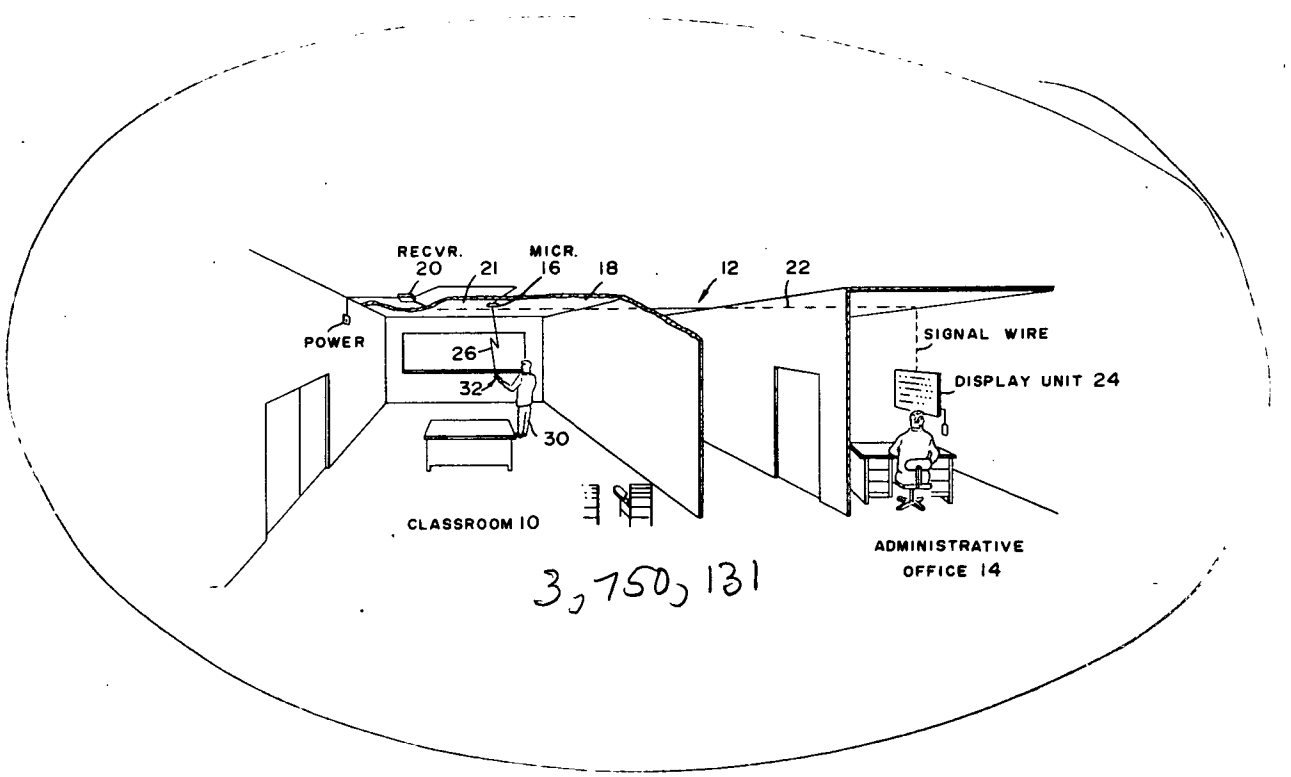
[57] **ABSTRACT**

In a school each classroom (or other area) is instrumented with a hidden microphone and receiver tuned to a non-audible frequency. The receivers' outputs are connected to a central display unit in the school's administrative office. Each instructor is provided with a small concealable transmitter which, when hand activated by the instructor upon the occurrence of any emergency, generates a non-audible signal at the receiver's tuned frequency.

2 Claims, 7 Drawing Figures



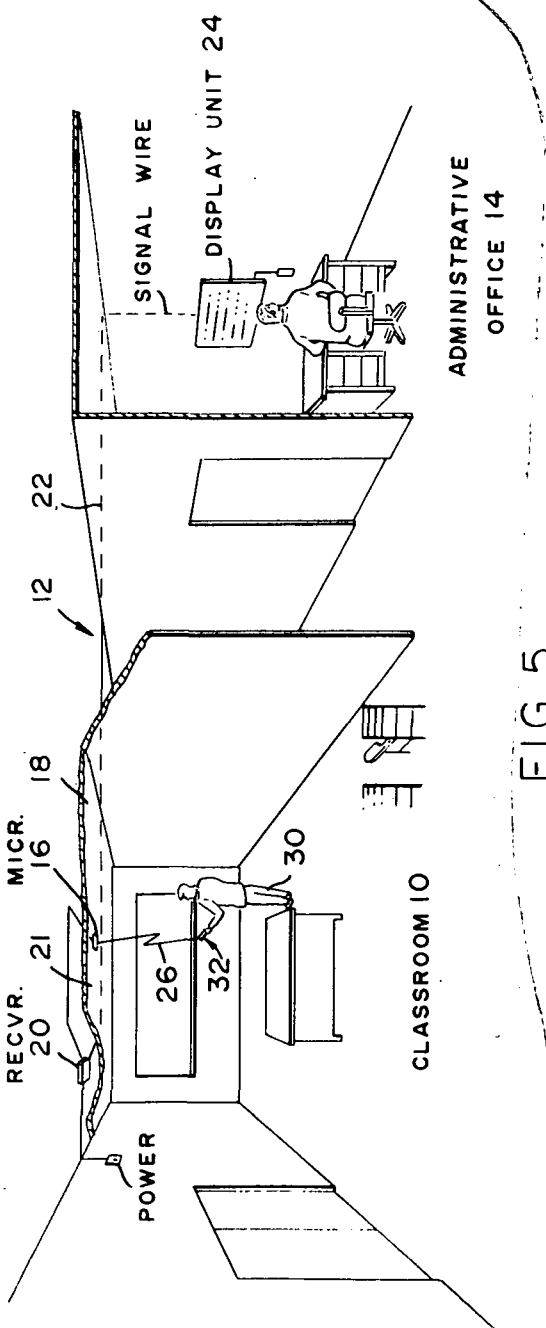


FIG. 1

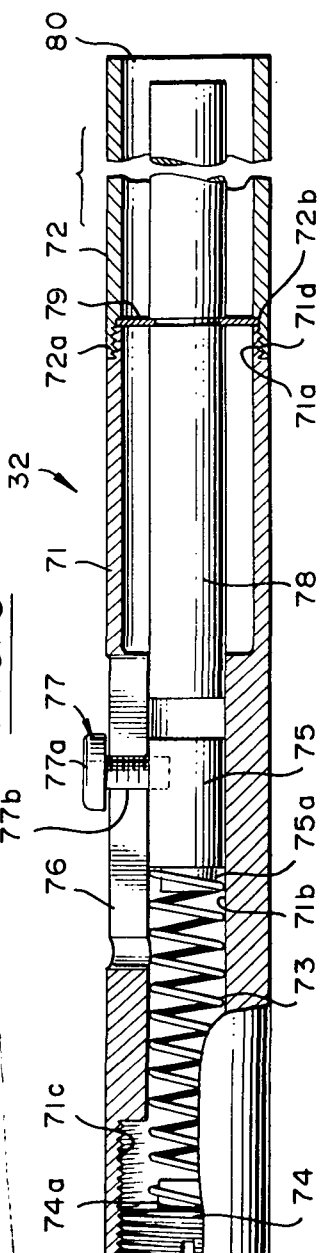


FIG. 5

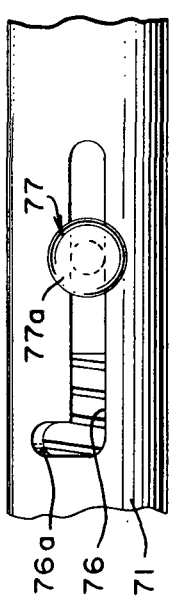


FIG. 6

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FIG. 2

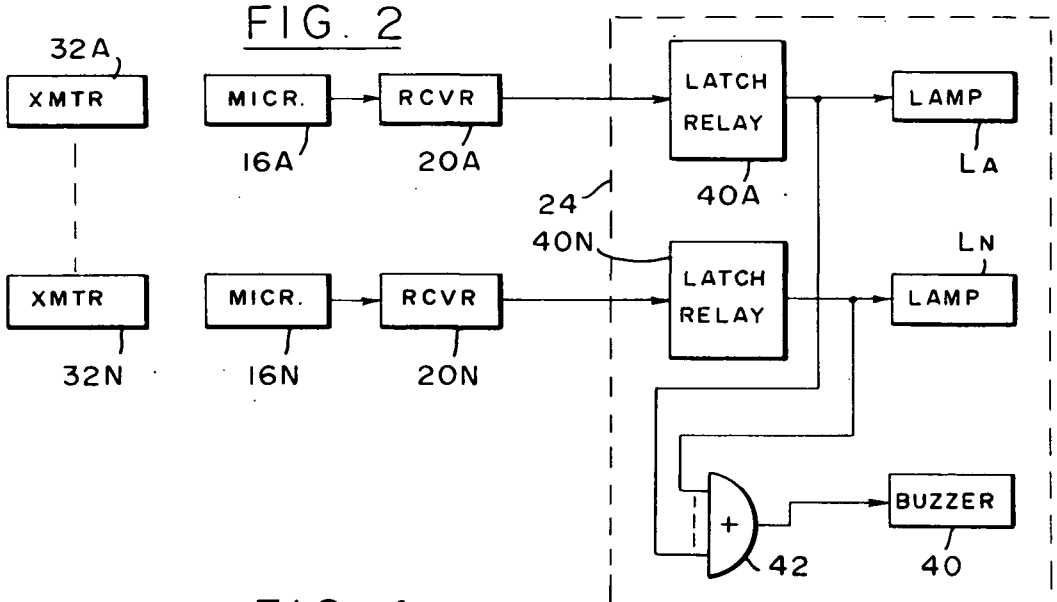

FIG. 4

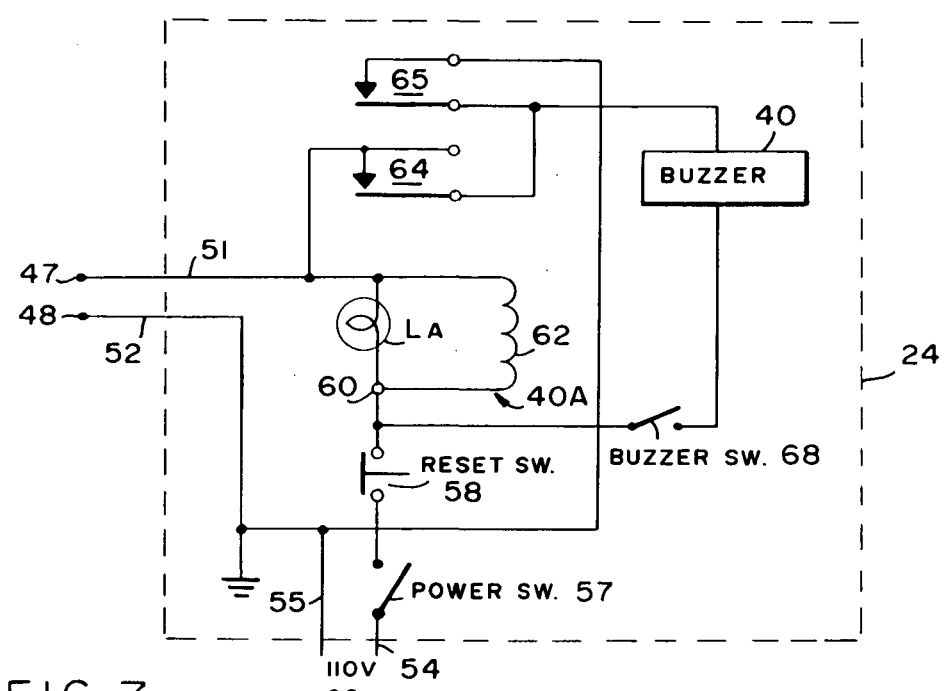

FIG. 7

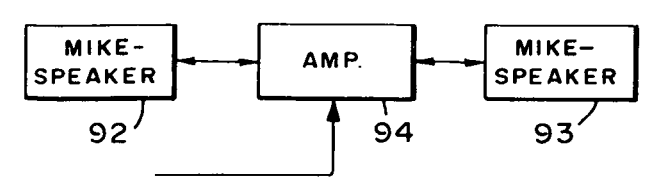

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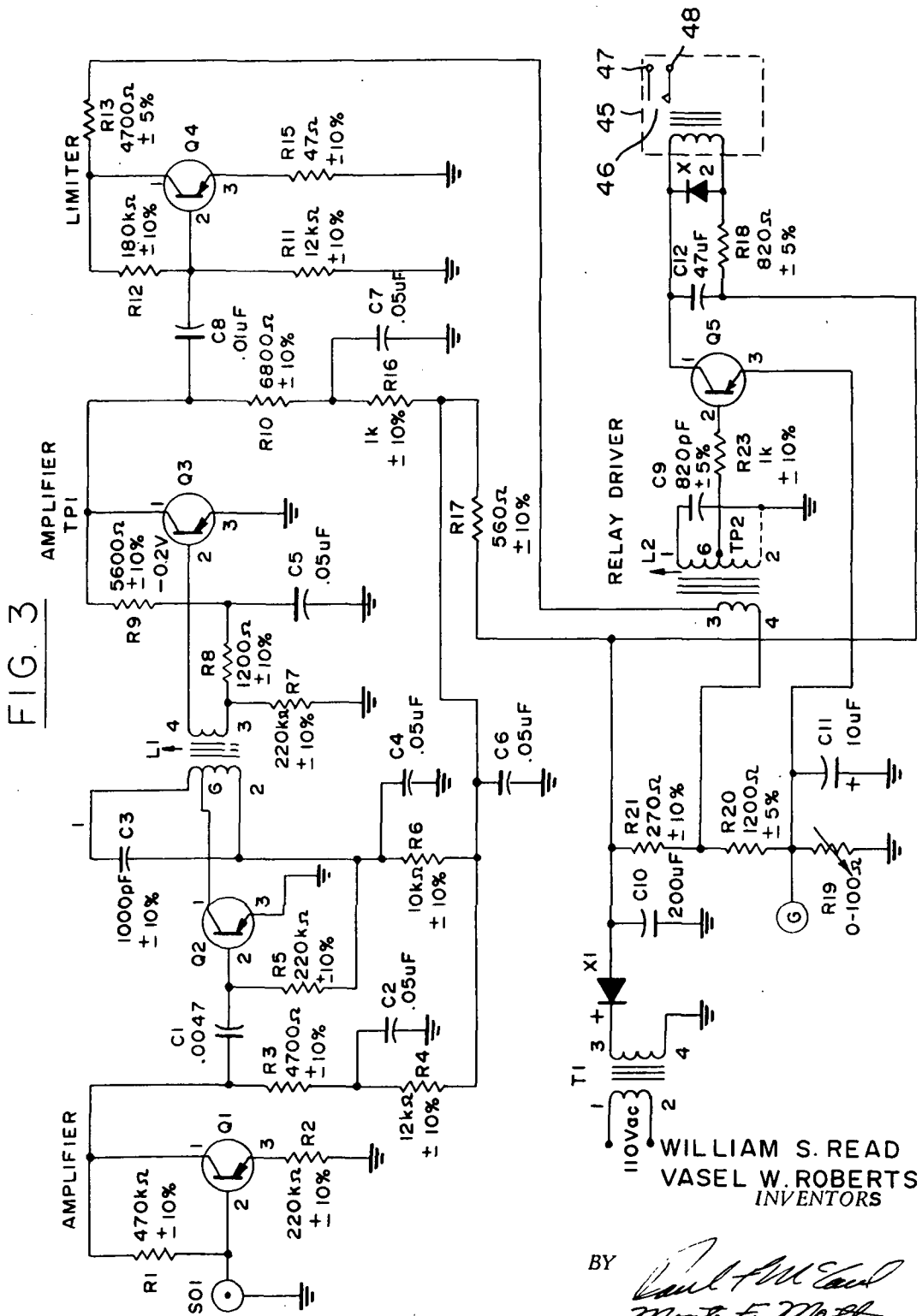
FIG. 3



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SILENT EMERGENCY ALARM SYSTEM FOR SCHOOLS AND THE LIKE

ORIGIN OF INVENTION

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85-568 (72 Stat. 435; 42 USC 2457).

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an emergency alert system and, more particularly, to a system for, and a method of, indicating the presence of an emergency in any chamber of a multichamber facility, such as a school or the like.

2. Description of the Prior Art

There are many multichamber facilities in which a particular condition, such as an emergency may arise in any of the chambers. In such a facility it is often desirable to communicate the existence of the emergency in the particular chamber to a central location for summoning aid, speedily. In some cases it is desirable to communicate the existence of the emergency in a manner which is not noticeable by persons in the chamber. For example, in some schools extreme disturbances have occurred in classrooms. Such disturbances have resulted from an attack on the teacher or on a student by another student or by an unauthorized person, invading the classroom. Student walkouts have also precipitated the need for assistance. Coping with such occurrences is sometimes beyond the physical capability of the instructor, particularly when the disruption is occasioned by unknown intruders.

It is desirable in such instances for the maintenance of order or to obtain police intervention, to make it possible for the instructor to summon help in a discreet manner. It is apparent that this capability would be beneficial to orderly school administration.

Similar situations may arise in different chambers or sections of a prison or like facility in which it is desirable to alert and request help to cope with an emergency in any compartment of the facility in such a manner that those in the compartment or room are not aware that aid is being requested. Although various emergency alarm systems are in existence in various facilities none exhibits such capabilities.

OBJECTS AND SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a new improved emergency alarm system for a multichamber facility to enable the indication of an emergency in any of the chambers.

Another object of the present invention is to provide a method of indicating at a central location the existence of an emergency in any chamber of a multichamber facility and the particular chamber in which the emergency exists.

A further object of the present invention is to provide a new small manually activatable transmitter of non-audible signals.

The invention will be described in connection with a school although it is equally applicable to other facilities in which similar requirements exist. The aforementioned and other objects are achieved by concealing

one or more sensors, hereafter also referred to as microphones, capable of sensing a non-audible signal in each of the classrooms or other instrumented areas, e.g., school cafeteria and gym. The sensor in each room is connected to a receiver, which is in turn connected to a central unit at a central location. Each instructor is provided with a small and inconspicuous hand-operated non-audible signal generator. The non-audible signal will hereafter also be referred to as a supersonic signal. When an emergency arises in a room the instructor impulses the generator to produce the supersonic signal which is picked up by the sensor in the room. Its output activates the receiver, which in turn activates in a display unit at a central location a buzzer as well as illuminates an indicator, such as a lamp, indicating the particular room in which the emergency exists. The output of each receiver may also be used to activate a two-way communication system to enable supervisory personnel at the central location to communicate audibly with the instructor in the room in which the emergency exists.

The novel features of the invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial diagram of a school instrumented with the present invention;

FIG. 2 is a general block diagram of the system of the present invention;

FIG. 3 is a schematic diagram of one embodiment of a receiver incorporated in the present invention;

FIG. 4 is a partial schematic and block diagram of a display unit shown in FIG. 1;

FIGS. 5 and 6 are diagrams useful in explaining a novel supersonic signal generator; and

FIG. 7 is a partial block diagram of a two-way communication system, controlled in accordance with the teachings of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The implementation of the teachings of the present invention in a school may best be explained in conjunction with FIG. 1. Therein numeral 10 designates a classroom in a school 12, which includes an administrative office 14. In the classroom 10 a sensor or microphone 16, designed to pick-up acoustic energy is installed such as in ceiling 18. The microphone is connected to a receiver 20 by means of wires 21. The receiver in turn is connected by wires 22 to a display unit 24, located in the administrative office 14. The receiver, which is preferably located adjacent the microphone, is a narrowband receiver and amplifier, and is tuned to provide an activating signal only when an acoustic signal within the narrowband is sensed by the microphone. In practice the receiver is tuned to a supersonic frequency above the audio range, e.g., 40–45 kHz.

When a signal of the tuned frequency is received, the receiver provides the activating signal which, when received by the display unit, causes the illumination of an indicator, e.g., a lamp, to indicate the room in which the supersonic signal was detected. The display unit includes one lamp for each area (such as the classroom) that is instrumented with a microphone and a receiver,

and the designation of the lamp in the display unit corresponds to the location whereat a supersonic signal was detected. In a preferred embodiment, the display unit includes a buzzer which is activated whenever any of the receivers provides an activating signal. The buzzer is used to alert administrative personnel to view the display unit and determine the room in which the supersonic signal was detected. Preferably, the buzzer and the illuminated lamp remain activated until they are reset by an operator.

The instructor, designated in FIG. 1 by numeral 30, in each classroom or other instrumented area is provided with a hand-activatable transmitter 32. The latter when activated by the instructor produces a supersonic signal represented by line 26 which is picked up by the microphone 16. As will be pointed out hereafter, the transmitter operates from mechanical energy that is stored by manually compressing a spring. When the spring is released by the instructor, a tuned bar of the transmitter is struck, and the bar vibrates at its resonant frequency. The latter is selected to correspond to the receiver's tuned frequency.

In the transmitter, contemplated herein, the bar is undamped except for the friction provided by its mounting arrangement. Thus the bar vibrates for an appreciable period to insure proper signal detection by the microphone. This is unlike prior art television remote control units in which bar vibration is damped so that each vibrating bar produces single pulse supersonic (or subsonic) television activating signals. Thus whereas in the prior art each transmitter activation produces a single pulse of supersonic energy at the vibrator's resonant frequency, in the present transmitter each transmitter activation results in a ringing effect of supersonic energy.

Attention is now directed to FIG. 2 which is a simple block diagram of the circuitry used in practicing the present invention. Therein it is assumed that the school includes A-N instrumented areas. Microphones 16A–16N and receivers 20A–20N are installed in the areas A-N respectively. In the particular diagrammed arrangement, the display unit 24 is shown including relays 40A–40N which are enabled by the outputs of receivers 20A–20N respectively, to enable the supply of power from an appropriate source (not shown), to lamps L_A–L_N, respectively. The outputs of the relays 40A–40N are assumed to be connected to a buzzer 40 through an OR gate 42 so that whenever any of the relays is activated or on, in addition to enabling the illumination of the lamp with which it is associated, it also activates the buzzer 40. The relay circuit is designed to hold the relay ON until it is reset. The circuit may include a reset button to reset the relay by switching it to OFF and thereby deactivate the illuminated lamp and the buzzer. As is appreciated, the system further includes transmitter 32A–32N which are carried by instructors in areas A-N, respectively.

It should be apparent that various known circuit design techniques may be used in implementing the circuitry of the present invention. Generally, the novelty of the invention is in the combination of circuits and the manner in which they are employed rather than in specific circuit embodiments. Although various circuits may be employed, for purposes of completing the description of the present invention a specific embodiment which was actually reduced to practice will be described.

FIG. 3 is a complete schematic diagram of of a typical receiver, such as receiver 20A assumed to be connected at shielded terminal S01 to microphone 16A. The receiver, which in the particular embodiment has a narrow bandwidth of 5kHz between 40 and 45 kHz, has an output relay 45. It is activated when the microphone detects a supersonic signal in the 40 to 45kHz band. Relay 45 has a pair of normally open contacts 46 connected to terminals 47 and 48. Thus when the relay is activated terminals 47 and 48 are shorted out.

FIG. 4, to which reference is now made, is a partial diagram of the panel unit 24 showing only the relay 40A, lamp L_A and buzzer 40. In this embodiment terminals 47 and 48 of relay 45 are connected to the panel unit 24, by lines 51 and 52, respectively, the latter being grounded. Power from an appropriate source such as 110V 60~is supplied to unit 24 on lines 54 and 55, the latter being grounded. Line 54 is connected through a power switch 57 and a reset switch 58 to a terminal 60 to which one end of lamp L_A and one end of coil 62 of relay 40A are connected. The other ends of the lamp and coil are connected to line 51. The relay includes two sets 64 and 65 of normally open contacts. The movable contacts of sets 64 and 65 are respectively connected to line 51 and to ground, while their stationary contacts are interconnected.

In operation as long as line 51 is ungrounded, the relay 40A is deactivated. However, when a supersonic signal is received by receiver 20A relay 45 is activated. Consequently, line 51 is grounded through line 52 and both relay 40A and lamp L_A are energized. Thus, the lamp is illuminated and the normally open contacts close. The relay 40A remains ON through its contacts even though thereafter relay 45 may become deenergized. As long as the relay 40A is ON, lamp L_A remains illuminated. Since the relay remains ON even after the activating signal from relay 45 terminates, and remains ON until reset, the relay may broadly be thought of as a latchable relay which is held ON (until reset) by holding currents passing through its contacts.

As shown, the buzzer 40 is connected at one end to the stationary contacts which are grounded as long as relay 40A is ON. The other end of the buzzer is connected to the ungrounded power line 54 at terminal 60 through a buzzer switch 68. Thus when the latter is closed and the relay 40A is ON, the buzzer is activated. By opening reset switch 58 the relay 40A is deactivated or turned OFF, thereby deenergizing both the lamp L_A and buzzer 40.

The rest of the receivers (20B-20N) are similarly connected to the unit 24, which includes the rest of the relays and lamps which are connected in a manner identical with that described for lamp L_A and relay 40A. In this particular embodiment, when the reset switch 58 is opened, the buzzer 40 and any activated relay are deenergized at the same time. Clearly if desired, a separate reset switch may be provided for each relay and the buzzer so that any one unit can be deenergized or reset without affecting the others.

Attention is now directed to FIG. 5 which is a cross-sectional view of a typical transmitter, such as transmitter 32A designed to provide a ringing rather than a pulse type supersonic signal. The particular transmitter is shown consisting of an outer cylindrical casing made up of two sections 71 and 72. Section 71 has a short externally threaded step 71a and section 72 has a corresponding internally threaded recess 72a which are

mated when the device is assembled as subsequently described. Section 71 is provided with a central bore 71*b*, which a compression spring 73 fits, and an internally threaded recess 71*c*, in which a spring retainer 74 may be adjustably threaded. Reduced projection 74*a* of the retainer fits into one end of spring 73. A hammer 75 which is slidably retained in bore 71*b* of section 71, has a reduced projection 75*a* which fits into the other end of spring 73.

Section 71 is also provided with an L-shaped slot 76 which can be seen in plan view in FIG. 6. Slot 76 is provided for retaining trigger 77 in position for cocking hammer 75. On of the useful features of the lateral section 76*a* of slot 76 is that when the transmitter is worn in a pocket in the manner of a pen. Should the wearer be grabbed, the cocked hammer 75 will be released by the jarring action of any altercation in which he may be involved. Trigger 77 consists of finger-operable button 77*a* which is connected with hammer 75 by means of threaded stud 77*b*, screwed into the hammer. Hammer 75 thus can be set in cocked position by first shifting button 77*a* axially in slot 76 toward detent portion 76*a*, and by then laterally rotating button 77*a* until stud 77*b* is engaged in the detent. Shifting button 77*a* as described compresses spring 73. The extent of this compression is determined by the position of retainer 74 in portion 71*c* of section 71.

On release of trigger 77 from the detent, the free end of hammer 75 impacts one end of vibrator 78 with great force, setting the latter into vibration at its resonant frequency in the manner of a tuning fork. Vibrator 78 is a metallic rod which is provided near its center with a ring groove for retaining a thin, flexible suspension disk 79. The flange of disk 79 is retained between sections 71 and 72 in groove 72*b* of the latter when the sections are threaded together in assembly. This provides a relatively free suspension for vibrator 78.

When rod 78 is impulsed by hammer 75, after release of trigger 77, it produces vibrations which emanate from the open end 80 of section 72. The dimensions of vibrator or rod 78 are chosen so that its resonant frequency is in the supersonic range, e.g., 45kHz. By suspending the rod 78 by disk 79, once imparted by hammer 75 it is free to resonate, or ring for a significant period, since except for the disk friction it is effectively undamped.

The size of the transmitter is quite small, generally like a ballpoint pen, so that it can be concealably carried and used by the instructor without being noticed by the students. Thus the instructor can summon help without the students becoming aware of the request. Herebefore it was assumed that one microphone is intalled in each instrumented area, such as a classroom or the like. Clearly, if desired, several microphones stratigically located in each area may be used to feed a single receiver. This is particularly desirable in large areas such as the school cafeteria or gym to insure that when a transmitter is activated in such an area, the supersonic signals are detected by at least one of the microphones.

Herebefore it was also assumed that the output of any receiver is used to illuminate a lamp associated therewith in the display unit and optionally further activate a buzzer. In schools equipped with two-way communication units between the classrooms and the administrative office, the receiver output may further be used to activate the two-way communication unit between the particular classroom and the office. This would enable the teacher requesting assistance to audibly communicate with the office personnel.

The two-way communication unit between each classroom and the office may be represented by a microphone-speaker 92 (see FIG. 7) installed in the classroom and connected to a microphone speaker 93 in the school office by a two-way amplifier 94. The receiver output relay 45 (see FIG. 3) may include an additional set of contacts connected to the amplifier 94. When an emergency arises in the room and the receiver is activated by the detection of the supersonic signal produced by the instructor-activated transmitter, these additional contacts may be used to control the amplifier gain automatically, e.g., increase it and thereby enable the instructor to audibly communicate with the office personnel. This feature may be particularly desirable under extreme emergencies which may prevent the instructor from directly activating the microphone-speaker 92 in the room.

There has accordingly been shown and described herein a novel emergency alarm system for schools or the like. The system enables an instructor in any classroom or other instrumented area to indicate to personnel in an administrative office the existence of an emergency in his area and request aid without others in the area being aware of the request. The system contemplates the installation of a microphone and a narrow band tuned receiver in each instrumented area. When an emergency arises, the instructor, equipped with a small concealable transmitter, hand activates the latter to produce a ringing supersonic signal which is picked up by the microphone, causing the receiver to produce an activating output signal. The latter is supplied to a display unit in the administrative office wherein a lamp, representing the particular classroom, is illuminated and if desired, a buzzer is energized to alert personnel to the existence of an emergency. By incorporating in the display unit one lamp for each instrumented area, the existence of emergencies in more than one area can be simultaneously displayed. If desired, the output of the receiver of each instrumented area can be used to activate a two-way communication unit to enable the instructor, in case of an emergency, to audibly communicate with the administrative personnel.

It is appreciated that those familiar with the art may make modifications or substitute equivalents in the arrangements herebefore described without departing from the true spirit of the invention. Therefore, it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:

1. In a stationary structure defining a plurality of discrete stationary locations and a central stationary location, a method of indicating at said central location the existence of an emergency in any of said discrete locations, the method including the steps of:

providing in each of said discrete stationary locations fixedly located detection means for detecting a supersonic signal generated therein;

providing in said central location display means, which are directly connected by means of continuous wires to the detection means in the various discrete locations, and which include a plurality of indicators, each associated with a different detection means and energized when the detection means

with which it is associated detects a supersonic signal;

generating in each discrete stationary location at which an emergency exists a supersonic signal which is detected by the detection means in the discrete location;

providing audio means in at least one of said discrete stationary locations, said audio means including a variabe gain audio amplifier; and

automatically increasing the gain of said amplifier when the detection means in the stationary location detect a supersonic signal which is generated therein.

2. In combination with a stationary structure defining a plurality of discrete stationary chambers each adapted to be occupied by a plurality of individuals and a stationary control location, a system for indicating at said control location the existence of an emergency in any of said chambers, the system comprising:

separate detection means installed in each stationary chamber for detecting a non-audible signal generated therein;

control means located in said control location, directly coupled to said separate detection means and including a separate energizable indicator for each separate detection means installed in each chamber, said control means further including means for energizing each indicator associated with a detection means which detects a non-audible signal;

signal generating means in each discrete stationary location for generating a non-audible signal therein; and

audio means associated with at least one of said stationary chambers, said audio means including a variable gain audio amplifier, and means for coupling said amplifier to the detection means in said chamber with the gain of said amplifier increasing when the detection means detect a non-audible signal in said chamber.

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